

National Health and Nutrition Examination Survey 2003-2004

Documentation, Codebook, and Frequencies

MEC Laboratory Component:
Syphilis(IgG), Syphilis Rapid Plasma
Reagin (RPR), and Treponema
pallidum Particle Agglutination (TP-
PA)

Survey Years:
2003 to 2004

SAS Export File:
L36_C.XPT



January 2006

NHANES 2003–2004 Data Documentation

Laboratory Assessment: Lab 36 - Syphilis-IgG, Syphilis Rapid Plasma Reagin, and *Treponema pallidum* Particle Agglutination

Years of Coverage: 2003–2004

First Published: January 2006

Last Revised: N/A

Component Description

Although there has been a marked decrease in the number of primary and secondary syphilis cases in the United States, there has been very little decrease in the number of reported cases of late latent and tertiary syphilis over the past 20 years. This suggests that there may be a large pool of infected but asymptomatic persons. Although the primary and secondary stages of syphilis are infectious and associated with fetal wastage and the congenital syphilis syndrome, the tertiary stage is associated with a vasculitis that may cause neurologic and cardiovascular manifestations and other chronic problems. Similarly, primary and secondary syphilis increase the risk of HIV acquisition and transmission, while latent disease may be associated with the progression of HIV disease to AIDS and more prominent neurologic disease in HIV-infected persons. Despite the importance of syphilis as a risk factor for both chronic disease and the progression of HIV infection, there has not been a population-based measure of syphilis prevalence for the United States since 1980. Because these are often asymptomatic stages of infection and may lead to severe neurologic or cardiovascular complications, it is important to document a decrease in the late stages of syphilis that have resulted from our extraordinary efforts to reduce primary and secondary syphilis. NHANES offers a unique opportunity to estimate the prevalence of reactive serologic tests as an estimate of the prevalence of syphilis infections in the general population, to identify and confirm risk factors for syphilis, to confirm the risk for HIV infection and HIV-related neurologic disease among Americans with syphilis, and to monitor trends in prevalence as syphilis detection and treatment programs are established and expanded.

Eligible Sample

Participants aged 18–49 years were tested.

Description of Laboratory Methodology

Syphilis-G enzyme immunoassay (EIA)

The Captia Syphilis-G enzyme immunoassay (EIA) is an indirect method for the detection of IgG antibodies to *Treponema pallidum*.

Currently, CDC recommends that the test be used in the clinical laboratory as a confirmatory test for the diagnosis of syphilis. However, the test may be used as a screening test and is FDA-approved for such use in clinical laboratories and blood banks. *T. pallidum* antigens are coated onto the wells of a 96-well microtiter plate. A dilution of the patient's serum is added to the well to allow any *T. pallidum*-specific antibodies present to bind to the treponemal antigens. Biotinylated anti-human IgG labeled with streptavidin-peroxidase is used to detect the patient's antibody. After rinsing off the excess antibodies, an enzyme substrate is added for detection. If the patient has antibodies to *T. pallidum*, a color reaction takes place. The intensity of the color development is proportional to the amount of antibody present. This color change can then be read using a plate reader, which eliminates subjective interpretation of the results.

Rapid plasma reagin (RPR)

The Rapid plasma reagin (RPR) 18-mm circle card test is a macroscopic, nontreponemal flocculation card test used to screen for syphilis. The antigen is prepared from a modified Venereal Disease Research Laboratory (VDRL) antigen suspension containing choline chloride to eliminate the need to heat-inactivate serum, ethylene-diamine-tetra-acetic acid (EDTA) to enhance the stability of the suspension, and finely divided charcoal particles as a visualizing agent. In the test, the RPR antigen is mixed with unheated or heated serum or with unheated plasma on a plastic-coated card. The RPR test measures IgM and IgG antibodies to lipoidal material released from damaged host cells, as well as to lipoprotein-like material and possibly cardiolipin released from the treponemes. The anti-lipoidal antibodies are antibodies that are produced not only as a consequence of syphilis and other treponemal diseases, but also in response to nontreponemal diseases of an acute and chronic nature in which tissue damage occurs. If antibodies are present, they combine with the lipid particles of the antigen, causing them to agglutinate. The charcoal particles coagglutinate with the antibodies and show up as black clumps against the white card. If antibodies are not present, the test mixture is uniformly gray. The test can be purchased in kit form or in component parts from many commercial sources. Without some other evidence for the diagnosis of syphilis, a reactive nontreponemal test does not confirm *T. pallidum* infection.

***Treponema pallidum* particle agglutination (TP-PA)**

The Serodia TP-PA test is a treponemal test for the serologic detection

of antibodies to the various species and subspecies of pathogenic *Treponema*, the causative agents of syphilis, yaws, pinta, bejel, and endemic syphilis. The test is a passive agglutination procedure based on the agglutination of gel particles sensitized with *T. pallidum* antigens by antibodies found in the patient's serum. The test is intended as a confirmatory test to replace the microhemagglutination assay for antibodies to *T. pallidum* (MHA-TP).

Serum containing antibodies to pathogenic treponemes reacts with gel particles sensitized with sonicated *T. pallidum*, Nichols strain (the antigen), to form a smooth mat of agglutinated gel particles in the microtiter tray well. If antibodies are not present, the particles settle to the bottom of the tray well, forming a characteristic compact button of unagglutinated particles. The unsensitized gel particle control well for each serum should also show this compact button or the absence of agglutination.

The TP-PA test is used to confirm the reactive results of a nontreponemal screening test for syphilis, such as the VDRL slide test, or as a diagnostic test in patients with a nonreactive nontreponemal test but with signs or symptoms suggestive of late syphilis.

There were no changes to equipment, lab methods, or lab site from the previous 2 years of NHANES.

A detailed description of the laboratory method used can be found on the NHANES website.

Laboratory Quality Control and Monitoring

The NHANES quality assurance and quality control (QA/QC) protocols meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed quality control and quality assurance instructions are discussed in the NHANES LPM. Read the LABDOC file for detailed QA/QC protocols.

A detailed description of the quality assurance and quality control procedures can be found on the NHANES website.

Data Processing and Editing

Serum specimens were processed, stored and shipped to Division of AIDS, STD, and TB Laboratory Research, National Center for Infectious Diseases, National Centers for Disease Control and Prevention, Atlanta, GA. Detailed specimen collection and processing instructions are discussed in the NHANES LPM. Read the LABDOC file for detailed data processing and editing protocols. The analytical methods are described

in the **Description of the Laboratory Methodology** section.

Detailed instructions on specimen collection and processing can be found on the NHANES website.

Analytic Notes

The analysis of NHANES 2003–2004 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2003–2004 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. They also contain all survey design variables and sample weights for these age groups. The phlebotomy file includes auxiliary information such as the conditions precluding venipuncture. The household questionnaire and phlebotomy files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

Testing algorithm for NHANES specimens

All serum specimens were tested for IgG antibody by the EIA assay. If results of this assay were positive or equivocal, the specimens were tested using the RPR test. If the RPR test was nonreactive or had a titer < 1:8, the TP-PA test was performed on the sample.

Suggested interpretation of laboratory results:

LBXSY1 = Syphilis-G enzyme immunoassay (EIA)

LBDSY3 = Rapid plasma reagin (RPR)

LBDSY4 = *Treponema pallidum* particle agglutination (TP-PA)

Positive serologic evidence of syphilis, more likely recent infection:

(LBXSY1 = 1 or LBXSY1 = 3) and (LBDSY3 ≥ 8)

Positive serologic evidence of syphilis, more likely remote infection:

(LBXSY1 = 1 or LBXSY1 = 3) and

(0 ≤ LBDSY3 < 8) and (LBDSY4 = 1)

No serologic evidence of syphilis infection:

LBXSY1 = 2

or

(LBXSY1 = 1 or LBXSY1 = 3) and (0 ≤ LBDSY3 < 8) and

(LBDSY4 = 2)

References

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Locator Fields

Title: Syphilis-IgG, Syphilis Rapid Plasma Reagin (RPR), and *Treponema pallidum* Particle Agglutination (TP-PA)

Contact Number: 1-866-441-NCHS

Years of Content: 2003–2004

First Published: January 2006

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Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: - Syphilis-IgG, Syphilis Rapid Plasma Reagin (RPR), and *Treponema pallidum* Particle Agglutination (TP-PA)

Record Source: NHANES 2003–2004

Survey Methodology: NHANES 2003–2004 is a stratified multistage probability sample of the civilian non-institutionalized population of the U.S.

Medium: NHANES Web site; SAS transport files

**National Health and Nutrition Examination Survey
Codebook for Data Production (2003-2004)**

**Syphilis(IgG), Syphilis Rapid Plasma Reagin (RPR)
and Treponema pallidum Particle Agglutination (TP-
PA) (L36_C)**

Person Level Data

January 2006



SEQN	Target
	B(18 Yrs. to 49 Yrs.)
Hard Edits	SAS Label
	Respondent sequence number
English Text: Respondent sequence number.	
English Instructions:	

LBXSY1	Target		
	B(18 Yrs. to 49 Yrs.)		
Hard Edits	SAS Label		
	Syphilis IgG EIA		
English Text: Syphilis IgG EIA			
English Instructions:			
Code or Value	Description	Count	Skip to Item
1	Positive	53	
2	Negative	2676	
3	Indeterminate	10	
.	Missing	237	

LBDSY3	Target		
	B(18 Yrs. to 49 Yrs.)		
Hard Edits	SAS Label		
	Syphilis RPR Titer Level		
English Text: Syphilis RPR (rapid plasmin test) titer level			
English Instructions:			
Code or Value	Description	Count	Skip to Item
0 to 32	Range of Values	63	
.	Missing	2913	

LBDSY4	Target		
	B(18 Yrs. to 49 Yrs.)		
Hard Edits	SAS Label		
	Syphilis TP-PA		
English Text: Syphilis treponemal pallidum agglutin (TPA)			
English Instructions:			
Code or Value	Description	Count	Skip to Item
1	Positive	26	
2	Negative	32	
3	Indeterminate	0	
.	Missing	2918	